

DOCUMENT RESUME

ED 387 004

HE 028 585

AUTHOR Terenzini, Patrick T.; And Others
TITLE First-Generation College Students: Characteristics, Experiences, and Cognitive Development. AIR 1995 Annual Forum Paper.
INSTITUTION National Center on Postsecondary Teaching, Learning, and Assessment, University Park, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE May 95
CONTRACT R117G10037
NOTE 31p.; Paper presented at the Annual Forum of the Association for Institutional Research (35th, Boston, MA, May 28-31, 1995).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Ability; College Students; Critical Thinking; Higher Education; *Institutional Research; Longitudinal Studies; Mathematics Skills; *Nontraditional Students; Reading Skills; *Student Characteristics; *Student College Relationship; Student Development; Student Experience
IDENTIFIERS *AIR Forum; *First Generation Students; National Study of Student Learning

ABSTRACT

This study, part of the longitudinal national Study of Student Learning, investigated the precollege characteristics and college experiences of 825 first-generation college students compared to those of 1,860 traditional students at 23 diverse institutions nationwide. First-year gains in students' reading, math, and critical thinking abilities were also compared for the two student groups. Compared to traditional students, findings indicated that first-generation students were more likely to: come from low income families; be Hispanic; have weaker reading, math, and critical thinking skills; have lower degree aspirations; and have less involvement with peers and teachers in high school. First-generation students also had the following characteristics: they have more dependent children, expected to take longer to complete their degree programs, had received less encouragement from their parents to attend college, tended to take fewer courses in the traditional fields and more courses in technical and preprofessional courses, spent fewer hours studying and more hours working, and were less likely to perceive faculty members as concerned with student development and teaching. Although traditional students made greater net gains in reading during their first-year, the two groups gained to about the same degree in math and critical thinking skills. (Contains 41 references and 3 tables.) (SW)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

FIRST-GENERATION COLLEGE STUDENTS: CHARACTERISTICS, EXPERIENCES, AND COGNITIVE DEVELOPMENT

by

Patrick T. Terenzini
Professor and Associate Director
National Center on Postsecondary Teaching,
Learning, and Assessment (NCTLA)
The Pennsylvania State University
403 South Allen St., Suite 104
University Park, PA 16801-5202
Telephone: (814) 865-5917
E-mail: ptt2@psuvm.psu.edu

Leonard Springer
Research Assistant
NCTLA--The Pennsylvania State University

Patricia M. Yaeger
Research Assistant
NCTLA--The Pennsylvania State University

Ernest T. Pascarella
Professor and Director
National Study of Student Learning
National Center on Postsecondary Teaching,
Learning, and Assessment
University of Illinois at Chicago

Amaury Nora
Associate Professor and Senior Research Associate
National Study of Student Learning
National Center on Postsecondary Teaching,
Learning, and Assessment
University of Illinois at Chicago

PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

AIR

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☒ This document has been reproduced as
received from the person or organization
originating it
- ☐ Minor changes have been made to
improve reproduction quality

- Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy

Paper presented at the meeting of the Association for Institutional Research, Boston, MA, May, 1995. The research of the National Center on Postsecondary Teaching, Learning, and Assessment is funded in part by the U.S. Department of Education, Office of Educational Research and Improvement (OERI) under Grant No. R117G10037. The opinions herein do not necessarily reflect the position or policies of OERI, and no official endorsement should be inferred.

BEST COPY AVAILABLE

FIRST-GENERATION COLLEGE STUDENTS: CHARACTERISTICS, EXPERIENCES, AND COGNITIVE DEVELOPMENT

Abstract

This study sought answers to three questions: 1) Do the precollege characteristics of first-generation students differ from those of traditional students? 2) Do first-generation students' college experiences differ from those of other students?, and 3) What are the educational consequences of any differences on first-year gains in students' reading, math, and critical thinking abilities? Answers come from 2,685 students (825 first-generation and 1,860 traditional students) who entered 23 diverse institutions nationwide in Fall 1992 and who completed one year of study. First-generation students differ from their traditional peers in both entering characteristics and college experiences. Although traditional students make greater net gains in reading during their first-year, the two groups gain to about the same degree in math and critical thinking skills. Those gains, however, result from different experiences.



for Management Research, Policy Analysis, and Planning

This paper was presented at the Thirty-Fifth Annual Forum of the Association for Institutional Research held at the Boston Sheraton Hotel & Towers, Boston, Massachusetts, May 28-31, 1995. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

**Jean Endo
Editor
AIR Forum Publications**

FIRST-GENERATION COLLEGE STUDENTS: CHARACTERISTICS, EXPERIENCES, AND COGNITIVE DEVELOPMENT

Obtaining a college degree -- and the associated personal, social, and economic benefits -- has long been a major part of the American Dream. Indeed, a bachelor's degree has often been considered a passport to the American middle class (e.g., Bowles & Gintis, 1976; Jencks & Riesman, 1968). Colleges and universities, however, have also been something more than major agents of personal development and advancement. They have been a major policy instrument in promoting upward mobility and educational, social, and economic equity for traditionally disadvantaged groups.

As colleges and universities have become increasingly accessible to women, people of color, and students from low income families, the profile of the undergraduate student body has changed with respect to students' age, enrollment status, attitudes, family conditions, and physical and psychological health, as well as gender and race/ethnicity (Hodgkinson, 1985; Levine, and Associates, 1989; Upcraft, in press). The evolution in the demographic profile of students entering higher education is projected to continue over the next decade. Many of these students (both white and non-white) will come from low-income homes and be the first in their families to pursue postsecondary education (Levine, and Associates, 1989).

While a daunting literature exists on the relation between parents' education and college choice, persistence, and performance, surprisingly little is known specifically about first-generation students. Large and important studies have been done on the characteristics and educational experiences of "new students," including adults (e.g., Cross, 1981; Solomon & Gordon, 1981), commuting students (e.g., Chickering, 1974), and students of color (see Mow & Nettles, 1990 for an excellent review), considerable fog creeps in as one attempts to review the literature on first-generation students given the apparent but imprecisely specified overlap between first-generation students and various categories of "non-traditional" students.

The limited available literature specifically on first-generation students falls into three, broad categories that resemble the temporal order of the college-going process itself. The first category consists of studies of first-generation students' precollege expectations, planning, or their college choice process (e.g., Attinasi, 1989; Conklin & Dailey, 1981; Murphy, 1981; Pratt & Skaggs, 1989; Stage and Hossler, 1989; York-Anderson & Bowman, 1991). York-Anderson and Bowman, for example, found differences between first-generation and traditional students with respect to their basic knowledge of college, personal commitment, and level of family support, with first-generation students being at a disadvantage in most cases. Attinasi identified two process-stages, one involving the attitudes and behaviors of students prior to matriculation (or "getting ready," as he calls it), and a second stage-process involving "getting in," referring to students' attitudes and behaviors after matriculation as they attempt to become academically and socially integrated in their new institution. Stage and Hossler found a positive relation between several parental characteristics, including educational level, which had a significant effect on their expectations for the educational attainment of their ninth-grade children and, in turn, on their children's own educational plans.

A second category of research on first-generation students concentrates on the transition between high school or work and college. Some of these studies (e.g., Lara, 1992; Rendon, 1992; Rodriguez, 1975, 1982) provide poignant accounts of personal experiences the authors encountered as the first in their families to attend college. First-generation students face all the anxieties, dislocations, and difficulties of any college student, but their experiences often involve cultural, as well as social and academic transitions (London, 1989; Weis, 1985, 1992). London examined the experiences of first-generation students struggling (as did Rendon and Rodriguez) to reconcile the conflicting roles and demands of family membership and educational mobility. London notes that "It is only when we see that mobility involves not just gain but loss . . . that we can begin to understand the attendant periods of confusion, conflict, isolation, and even anguish that first-generation students report here" (p.168). Similar findings are reported in Terenzini, Rendon, Upcraft, Millar, Allison, Gregg, and Jalomo (1994).

The third category of research on first-generation college students examines the effects of their college experiences on persistence during college, typically in comparison with their "traditional" peers (e.g., Attinasi, 1989; Bean & Metzner, 1985; Billson & Terry, 1982; Richardson & Skinner, 1992; Skinner & Richardson, 1988). These studies consistently indicate that first-generation students are at greater risk with respect to both persistence and degree attainment than are their traditional peers largely because of lower levels of academic and social integration (Billson & Terry, 1982). While not specific to first-generation students, most studies of persistence or degree attainment include parents' education as a critical predictor variable (see the reviews of Spady, 1970; Tinto, 1975; Pantages & Creedon, 1978). With few exceptions, parents' education, or the broader concept of socioeconomic status, is positively related to student persistence and degree completion.

Beyond factors shaping first-generation students' persistence behaviors, however, we found no studies examining first-generation students' experiences during college, or their cognitive or psychosocial development. Thus, this study sought answers to three questions: 1) Do first-generation students' precollege characteristics differ from those of "traditional" (i.e., not first-generation) students? 2) Do first-generation students' experiences during the first year of college differ from those of traditional students?, and 3) What are the consequences of any differences on students' cognitive development?

METHODS

Conceptual Framework

The basic conceptual model for this study (see Figure 1) is longitudinal and draws upon many of the elements of recent conceptualizations of college impact (e.g., Astin, 1984; Pascarella, 1985; Tinto, 1975, 1987; Weidman, 1989). The model hypothesizes six sets of constructs defining a causal sequence that begins when students come to college with a wide array of educationally-relevant background characteristics (including level of cognitive development). These precollege characteristics are presumed to influence not only the

Insert Figure 1 about here.

outcomes of college directly, but also students' course-taking patterns, formal classroom experiences, and out-of-class experiences during college, which, in turn, also shape educational outcomes. The interplay between and among these sets of influences on learning takes place within a particular institutional context (e.g., organizational characteristics, policies, structures, and culture).

The present study is not a test of the validity of the causal structure of this model, but the model does serve two, useful purposes. First, it identifies those categories of variables that have potential for shaping educational outcomes (in this case, cognitive development). Second, it suggests a causal sequence that forms the basis of the analyses undertaken to answer Question #3 (see below). In addressing that question the study estimates the influence on first-year on cognitive gains by those aspects of college (i.e., students' curricular, classroom, and out-of-class experiences, as well as selected institutional characteristics) on which first-generation and traditional students may differ. These estimates are made after taking into account certain of the precollege characteristics on which the two categories of students differ, including initial reading, math, and critical thinking abilities.

Institutional Sample

This study is part of the National Study of Student Learning (NSSL), a three-year longitudinal, national study of some 4,000 new students who, in the Fall of 1992, entered 18 four-year and 5 two-year colleges and universities nationwide. NSSL is being conducted by the National Center on Postsecondary Teaching, Learning, and Assessment (NCTLA), a national research and dissemination center funded by the U.S. Department of Education's Office of Educational Research and Improvement (OERI).

Institutions were selected from the National Center on Education Statistics' Integrated Postsecondary Education Data System (IPEDS) database to represent differences in colleges and universities nationwide on a variety of characteristics, including institutional type and control (e.g., private and public research universities, private liberal arts colleges, public and private comprehensive universities, two-year colleges, historically black colleges), size, geographic location, commuter versus residential character, and the ethnic distribution of the undergraduate student body. In the aggregate, the student population of these 23 institutions approximates the national population of undergraduates by ethnicity and gender.

Student Sample and Instruments

The initial data collection was conducted in the Fall of 1992. Each of the 23 participating institutions was given a target sample size relative in magnitude to the respective sizes of the entering class at each institution. The overall target sample was 5,000 students.

The overall obtained sample size (i.e., those students actually participating) for the Fall, 1992 data collection was 3,840, a participation rate of 76.8 percent. Insofar as possible, students at each institution were sampled randomly from among new students.

The initial data collection lasted approximately three hours. Students were advised that they were participating in a national, longitudinal study of student learning and would be paid a \$25 stipend for their participation. They were also advised that the information they provided would be kept confidential, would never become part of their institutional records, and that all that was expected of them was a good-faith effort on the test modules (see below) and a candid response to all other questionnaire items.

An NCTLA-developed precollege survey form gathered information on student demographic characteristics and background, as well as their aspirations, expectations of college, and orientations toward learning. Participants also completed Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP). The CAAP was developed by the American College Testing Program (ACT) specifically to assess selected general skills typically acquired by students during the first two years of college (ACT, 1989). The total CAAP consists of five, 40-minute, multiple-choice test modules, three of which -- reading, math, and critical thinking -- were used in this study.

A follow-up testing of the sample took place in the Spring of 1993. This data collection required about three and one-half hours and included Form 88B of the CAAP, Pace's (1984) College Student Experience Questionnaire (CSEQ) to measure students' first-year experiences in college, and a specially-designed follow-up survey form assessing aspects of students' first-year experiences not covered by the CSEQ. Students were paid a second stipend (\$35) for their participation in the follow-up data collection. Of the original sample of 3,840 students who participated in the Fall, 1992 testing, 2,685 participated in the Spring, 1993 data collection, yielding a response rate of 69.9 percent. Of these respondents, 825 (30.7%) were first-generation students (i.e., having no parent with any college or university experience) and 1,860 (69.3%) were "traditional" students.

Given the high response rates at both testings, it is not particularly surprising that the sample was reasonably representative of the population from which it was drawn. Nonetheless, to adjust for potential response bias by gender, ethnicity, and institution, a sample weighting algorithm was developed. Specifically, within each individual institution, participants in the follow-up data collection were weighted so as to be representative of the institution's first-year population by gender (male or female) and ethnicity (white, Black, Hispanic, other). Thus, for example, if Institution A had 100 Black men in its entering class and 25 Black men in the sample, each Black male in the sample was given a sample weight of 4.00. An analogous weight was computed for participants falling within each gender x ethnicity cell within each institution. The effect of applying sample weights in this manner was to adjust not only for response bias by gender and ethnicity, but also for differential response rates across institutions. Given the sampling plan that led to the selection of the 23 institutions in this study and the weighting of individual respondents within each institution,

the weighted aggregate sample of 2,685 students is reasonably representative of the fall, 1992 national population of first-year students with respect to gender and ethnicity.

Variables

The dependent variables in Question #3 of this study were the Spring, 1993 scores on the CAAP reading, math, and critical thinking tests. The CAAP reading test contains 36 items that assess reading comprehension as a product of skill in inferring, reasoning, and generalizing. The test consists of four prose passages of about 900 words in length that are designed to be representative of the level and kinds of writing commonly encountered in college curricula. The passages were drawn from topics in fiction, the humanities, the social sciences, and the natural sciences. The KR-20 internal consistency reliabilities for the reading test range between .84 and .86. The 35-item mathematics test is designed to measure a student's ability to solve mathematical problems encountered in many postsecondary curricula. The emphasis is on quantitative reasoning rather than formula memorization. The content areas tested include pre-, elementary, intermediate, and advanced algebra; coordinate geometry; trigonometry, and introductory calculus. The KR-20 reliability coefficients for the math test range between .79 and .81. The critical thinking module is a 32-item instrument that measures a student's ability to clarify, analyze, evaluate, and extend arguments. The test consists of four passages designed to be representative of the kinds of issues commonly encountered in a postsecondary curriculum. A passage typically presents a series of subarguments that support a more general conclusion. Each passage presents one or more arguments and uses a variety of formats, including case studies, debates, dialogues, overlapping positions, statistical arguments, experimental results, or editorials. Each passage is accompanied by a set of multiple choice questions. The KR-20 reliability coefficients range from .81 to .82 (ACT, 1989). In a pilot test with a sample of 30 college students, the CAAP critical thinking module was found to correlate .75 with the total score on the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980).

Following the conceptual framework for this study, five sets of independent variables were developed. The first set contained 36 precollege characteristics, including students' gender, race/ethnicity, total family income, degree aspirations, and students' precollege scores on the CAAP reading, math, and critical thinking tests. These variables are listed in Table 1, given in the Results section. Examination of the distributions of the nominal variables (e.g., race/ethnicity and gender) indicated that the limited skewness present was unlikely to bias regression parameter estimates.

Four additional sets of independent variables were developed, each operationalizing a portion of the conceptual framework shown in Figure 1. The curricular experiences variable set contained 8 indicators. Students' formal academic experiences were reflected in 12 variables, their out-of-class experiences by 15 indicators, and their institution's structural and contextual characteristics by 12 variables. The specific variables in each set are listed in Table 2 (also given in the Results section).

Analytical Procedures

To answer Question #1 (concerning initial differences between first-generation and traditional students), the 36 precollege characteristics were entered into an ordinary least-squares (OLS) multiple regression with group membership (1 = first-generation student, 0 = traditional; first-generation students were defined as those with no parent who had attended college). [Analyses were also done using logistic regression and discriminant function analysis, but the results were essentially the same. OLS was adopted as producing results that are easier to interpret and more familiar to most readers.] A stepwise procedure was adopted. This method enters independent variables one at a time on the basis of each measure's ability to explain the largest amount of the total variance not attributable to variables already in the model. The result is an optimal prediction equation with as few variables as possible.

To answer Question #2 (differences between the groups in their experiences of college), a series of four setwise OLS regressions with group membership as the dichotomous, dependent variable were performed. Consistent with the conceptual framework shown in Figure 1, group differences were tested in four areas listed above. Each of the four experience variable sets was regressed separately on group membership after controlling for those precollege characteristics on which the two groups differed in the analysis for Question #1. In the regression for any given set of college experiences, the other experience variable sets were not included so as not to mask the influence of any variable in the target set that might be of practical or theoretical interest. The beta weights (standardized regression coefficients) were used to identify the specific experiences in each experience variable set that were statistically significant after controlling for precollege characteristics and all other experiences in that same set.

In the analyses for Question #3 (whether group differences in college experiences had differential effects on first-year cognitive developmental gains, three setwise OLS regressions (one for each dependent variable) were employed, each having three steps. In the first step, students' scores on one of the three CAAP tests (reading, math, or critical thinking, in seriatim) at the end of the first-year were regressed, first, on the precollege characteristics on which the two groups differed in the analysis for Question #1. For this analysis, students' precollege scores on the appropriate CAAP module (e.g., precollege reading score when reading was the dependent variable) and group membership were also included as additional control variables.

In the second step, the set of college experience variables (combined from all four influence areas) on which the groups differed (see analyses for Question #2) were entered. Finally, to test whether the college experiences on which the groups had differential educational effects (i.e., impacts that differed for the two groups) for any of the three cognitive outcome variables, a set of 21 cross-product interaction terms was entered (group membership x each of the 21 college experience variables on which the two groups differed in the analyses for Question #2). If the addition of the set of interaction terms produced a statistically significant increase in the magnitude of the R^2 for the full, main effects model

(i.e., the one containing all precollege characteristics and college experiences on which the two groups differed in the analyses for Questions 1 and 2), then the significance of the regression weights were examined to identify those interaction terms which indicated a non-chance, differential effect. Significant interaction terms were then plotted (using the unstandardized regression weights) to gain an understanding of the nature of the differential effects.

At this point in the overall analytical plan, least-squares analysis of covariance techniques were employed to determine whether first-generation and traditional students differed in their first-year gains on any of the three cognitive measures after controlling for differences in precollege characteristics.

RESULTS

Analyses for Question #1

The results of the analyses to answer Question #1 are shown in Table 1. All beta weights shown there are statistically significant at $p < .05$ or beyond. First-generation and traditional students differed on 14 of the 36 precollege characteristics. As can be seen in the table, the largest differences between the two groups were on total family income and being Hispanic. In addition to being more likely to come from lower-income homes and having Hispanic family origins, first-generation students, compared to their traditional peers, were also more likely have lower initial critical thinking abilities, lower degree aspirations (from this or any college), to have spent less time socializing with peers and talking with teachers while in high school, and to be women. First-generation students were also more likely to have more dependent children, to expect to need additional time to complete their degrees, to

Insert Table 1 about here.

be more confident in their choice of a major field, and to have spent more hours per week working while in high school. First-generation students were also less likely to have received such encouragement from their families. While the beta weight suggests first-generation students were more likely than traditional students to have received encouragement to attend college from their high school teachers, a simple t-test indicates the two group means do not differ significantly. Thus, caution is advised in attaching practical importance to this finding. Only on the certainty of their academic major do first-generation students have an advantage over their traditional peers on variables that have been shown to be related to academic performance and persistence.

Because of the moderate to high correlations among the three CAAP tests (range = .476 to .768), it appeared at least possible that students' initial reading and math skill levels did not enter the stepwise regression because of the dominance of the critical thinking test

scores. To determine whether the groups also differed in their reading and math ability levels, simple t-tests were performed. Those tests indicated that the two groups did, indeed, differ at statistically significant levels ($p < .001$) in precollege reading and math skills. In both instances, traditional students scored higher than first-generation students (means = 62.06 v. 59.52, respectively, in reading, and 58.626 v. 56.362 in math).

Analyses for Question #2

Differences in first-generation and traditional students' experiences of college are shown in Table 2. As can be seen there, after controlling for the variables shown in Table 1, first-generation students (compared to their traditional peers) were likely to take fewer courses in the humanities and fine arts and social sciences, to enroll for fewer hours in their initial college semester, and to complete fewer total hours during their first academic year. They were more likely to take technical and pre-professional courses.

Insert Table 2 about here.

With regard to their instructional experiences and formal academic contacts with faculty members, first-generation students were less likely to participate in an honors program and to spend fewer hours per week studying. While the beta weight suggests they were more likely than traditional students to make use of the library, a two-tailed t-test of the difference in group means on this CSEQ scale indicated no significant difference. Thus, this latter finding may be artifactual, probably due to multicollinearity among the variables in the analysis.

In their out-of-class experiences, first-generation students (vs. traditional students) worked more hours per week off-campus, but they were less likely to perceive faculty members as concerned for student development and teaching, to participate in a racial/ethnic awareness workshop, receive encouragement from friends to continue their enrollment, and to have the experiences typically associated with residence hall life. The analyses indicated first-generation students were more likely to report positive peer relations and to participate in orientation programs, but these two findings appear to be artifactual. Both reported peer relations and participation in orientation are inversely correlated (-.07 and -.05, respectively) with being a first-generation student, and the signs of their beta weights are opposite the direction of the differences in group means.

First-generation (vs. traditional) students were more likely to perceive the institution's administrative personnel as being flexible and helpful to students and less likely to report safety concerns or feeling like an outsider, but they were also more likely to report having experienced discrimination in the classroom and to view their institutions as having an environment that emphasizes being critical, evaluative, and analytical. The beta weights in

Table 2 also indicate that first-generation students were more likely to perceive their institution's environment as emphasizing academic, scholarly, and intellectual qualities, and less likely to perceive their institution's environment as having a vocational or occupational emphasis. These latter two findings are discounted as statistical artifacts, however, inasmuch as the signs of the zero-order correlations with first-generation status (-.05 and +.01, respectively) are opposite those of the beta weights, and the group means are in directions opposite those indicated by the weights.

Analyses for Question #3

The three analyses of covariance (ANCOVA; one each for reading, math, and critical thinking scores, controlling for the 14 significant precollege differences between the two groups) indicated no differences between first-generation and traditional students in first-year gains in mathematical or critical thinking abilities. That is, despite the initial differences in group scores on all three CAAP tests (first-generation students being lower on each), after controlling these and other precollege student differences, the two groups gained in math and critical thinking skills to about the same degree. Traditional students, however, made greater gains than their first-generation peers in reading comprehension, even after precollege reading abilities were controlled (gains = from a mean of 62.06 to 62.97 for traditional students, and from 59.52 to 59.97 for first-generation students).

As will be seen below, the entry of each of the three sets of interaction terms produced statistically significant, if small, increases in the amount of variance explained by the full, main-effects-only model. These findings suggest that differences between first-generation and traditional students in certain of their college experiences are associated with differential cognitive outcomes after one year.

Across the three cognitive outcomes, a total of 10 interaction terms produced statistically significant beta weights ($p < .05$ or beyond). Four of these, however, were discounted because of evidence given earlier suggesting their main effect beta weights were statistical artifacts. Table 3 summarizes the nature of the six remaining interaction terms. Plotting those interactions, however, yields a rather foggy, and sometimes counter-intuitive, picture of the nature of those effects.

Insert Table 3 about here.

In the analyses testing for differential effects of college experiences on students' year-end reading comprehension levels, students' background characteristics (including precollege reading level) produced an R^2 of .591. The addition of the college experiences variable set (main effects) increased the variance explained by .043 (4.3 percentage points), significant at $p < .001$. Entry of the 21 cross-product interaction terms produced a small, (.009) but statistically significant ($p < .001$) increase (.009; from .6334 to .6428) in the R^2 above and

beyond that attributable to differences in first-generation and traditional students' precollege characteristics and experiences of college. Of the six statistically significant interaction terms, four involved differential effects on gains in reading comprehension.

First-generation students benefitted more than their traditional peers (who benefitted not at all) from taking social science courses. In addition, perceptions that faculty members were concerned with student development and teaching had a positive effect on first-generation students' gains in reading, but the effect was even more pronounced for traditional students. The other two significant interaction terms are more difficult to interpret. The level of encouragement from friends to continue enrollment was inversely related to reading gains among first-generation students but positively associated with gains among traditional students. No explanation for this interaction is readily apparent. Similarly, hours worked off-campus appears to promote reading gains among first-generation students while it depresses gains among traditional students. The latter effect might be expected, but why working more hours off-campus should facilitate greater reading gains for first-generation students is more difficult to explain. One possible (but perhaps far-fetched) explanation is that as the time demands on working first-generation students increases, it requires a corresponding increase in students' attention and concentration on school work, which may lead, in turn, to greater gains in reading skills.

In the analysis of CAAP mathematics gains, student's precollege characteristics produced an R^2 of .70. Entry of the college experience variables (main effects) increased the variance explained by .019 (1.9 percentage points), statistically significant at $p < .001$. Addition of the set of interaction terms also produced a small (.006; from .7189 to .7250), but statistically significant ($p < .001$) increment increase in the R^2 beyond that for the full model. Two of the six significant terms suggested college experiences with differential effects on students math skill development, but interpretation of these interaction terms is highly problematic. Taking social science courses and perceiving campus administrators as flexible and considerate of students both had positive effects on first-generation students' math skills, but negative effects on those of traditional students. Why either the nature or direction of these effects should be related to math skill gains is not easily divined.

In the regression on students' CAAP critical thinking scores, students' background characteristics explained 63 percent of the variance ($R^2 = .0699$). Inclusion of the college experience variables (main effects) produced an increment of 3.3 percent (.033), statistically significant at $p < .001$. Addition of the set of interaction terms again produced a small (.007; from .663 to .670) but statistically significant ($p < .001$) increment in the R^2 value. Only one of the six statistically significant group x college experience interactions had a differential impact on year-end critical thinking abilities. Perceptions that the institutional environment emphasized being critical, evaluative, and analytical had a positive effect on both first-generation and traditional students, but the effect was stronger for the former than the latter. It seems reasonable to suggest that institutions with environments that emphasize being critical, evaluative, and analytical (compared with those that do not) are more likely to enhance their students' critical thinking skills. This finding is consistent with research indicating environmental influences on changes in attitudes and values and the limited

evidence suggesting that institutional curricular structures can influence critical thinking (Pascarella & Terenzini, 1991). It is also consistent with Astin's (1993) finding that campuses with a strong "humanities orientation" (i.e., they put strong emphasis on the liberal arts) and a student-oriented faculty have a positive influence on students' self-reported gains in critical thinking. The results of these analyses suggest that such an environmental influence, while a positive influence for both groups of students, is even more beneficial for first-generation students' critical thinking skills.

Limitations

This study has several limitations. First, although the sample is multi-institutional and contains a broad range of two- and four-years institutions, the 23 colleges and universities were selected purposively and not at random. Thus, to an unknown degree, these institutions may not be representative of the national mix of colleges and universities.

Second, although attempts were made in the initial sampling design and subsequent weighting of respondents to yield a sample of students who, in the aggregate, would be representative of the national population of new students entering colleges and universities in the Fall of 1992, the time commitment and work required of each student participant undoubtedly led to some self-selection. One cannot be sure that those who were willing to participate in the study responded in the same fashion as would those who were invited but declined to participate.

Third, while the unique contributions of each of the college-influence variables (reflected in their beta weights) are statistically significant (perhaps due to the relatively large sample size), the magnitudes of those influences are comparatively small. The estimated effects sizes, however, may be constrained by measurement and analytical artifacts. First, many commercially-available instruments are constructed so as to produce relatively stable measurements over time (Winter, 1979; Winter, McClelland, & Stewart, 1981), thus tending to underestimate the actual magnitude of change. Second, the estimates may be artificially low because of the high correlation between the precollege CAAP test scores for each learning outcome (included as control a variable in the appropriate analysis) and their year-end counterpart scores (pre- and post-year score correlations: reading = .75, math = .82, and critical thinking = .79). With each precollege measure explaining half or more of the variance in the dependent measure, college experience variables are limited in the amount of unexplained variance for which they can account. In addition, the effect size estimates may be further constrained by the fact that most first-year courses do not systematically stress the development of students' reading, math, and critical thinking skills. Thus, despite the small effect sizes, the findings of this study must be considered at least suggestive of the dynamics of college impact on the cognitive gains of first-generation and traditional students and should probably be considered lower-bound estimates.

Fourth, while reading, math, and critical thinking are basic educational outcomes, they are certainly not the only dimensions along which students develop academically and

intellectually during the college years. Moreover, alternative conceptualizations of the components of all three skill areas have been advanced, and the results might have been somewhat different had different measures of each skill area been used.

Finally, reading, math, and critical thinking skills develop over time and at varying rates. This study is limited by the fact that changes in these cognitive skill areas were examined after only one year of college. Changes in these areas in subsequent years may be greater or smaller than those reported here, and the sources of influence on those gains may, themselves, vary over time.

SUMMARY AND CONCLUSIONS

This study explored the characteristics, college experiences, and cognitive development of 825 first-generation students (i.e., neither parent has had any college or university experience) and 1,860 "traditional" students attending 23 two- and four-year institutions around the country. Three questions were posed: 1) Do first-generation students' precollege characteristics differ from those of "traditional" (i.e., not first-generation) students? 2) Do first-generation students' experiences during the first year of college differ from those of traditional students?, and 3) What are the consequences of those differences on students' cognitive development?

The findings of this study are highly consistent with those reported earlier in studies that based on small-sample, qualitative methods (e.g., Lara, 1992; London, 1989; Rendon, 1992; Rodriguez, 1975, 1982; Richardson & Skinner, 1992; Weis, 1985, 1992). The portrait this study paints of first-generation students as they enter college differs in a number of ways from that of their traditional peers, and the differences suggest potential problems ahead for first-generation students. Compared to their traditional peers, first-generation students are more likely to come from low income families, to be Hispanic, to have weaker cognitive skills (in reading, math, and critical thinking), to have lower degree aspirations, and to have been less involved with peers and teachers in high school, probably (in part) because they also worked more hours. First-generation students also had more dependent children, expected to take longer to complete their degree programs, and had received less encouragement from their parents to attend college. In addition to these background and demographic differences identified in this study, first-generation students are also known to come to college facing a number of psychological and emotional obstacles, including anxiety about their ability to succeed and stressful changes in their relations with families and friends (Rendon, 1992; Rodriguez, 1975; London, 1989). Overall, the portrait is one of students at risk. Moreover, it is a portrait of a group whose size and proportional representation on college and university campuses is expected to grow over the next decade.

One clear implication of this evidence is the need to smooth first-generation students' transitions from work or high school to college and to extend active, targeted support throughout their first year, if not beyond. "Bridge" programs involving collaboration between high schools, community colleges, and four-year institutions have proven to be successful. The most successful programs have provided "systematic and comprehensive

academic support services (such as assessment and remediation, learning laboratories, tutorial services, intrusive advising, and monitoring of student progress) until a student was firmly established in a major" (Richardson & Skinner, 1992, p. 39). Rendon (1992), however, stresses the importance of more subtle forms of support, what she calls "validating" experiences, when administrators, faculty, and other students all send important signals to first-generation students that they are competent learners, that they can succeed, that they have a rightful place in the academic community, and that their background and past experiences are sources of knowledge and pride, not something to be demeaned or devalued. It is important that institutions and people reach out to first-generation students, for many will be reticent in a new environment, unaware of what is available and of what questions to ask. Reaching out, however, means more than advertising the availability of support services. It also means actively making contact with new students and changing current practices or policies that impede rather than facilitate first-generation students' academic and social integration and success. First-generation students will be making changes, but, as Rendon notes, institutions must do the same if they are to become more hospitable and accommodating to the learning needs of first-generation students.

First-generation students not only brought to college background characteristics that differed from those of traditional students, the two groups also had different curricular, instructional, and out-of-class experiences, as well as different perceptions of the environments of the institutions they were attending. In their academic lives, first-generation students (compared to their traditional peers) tended to take fewer courses in the traditional fields and, instead took more technical and pre-professional courses. They also reported fewer hours studying, probably because they continued to spend more hours working off-campus.

In their out-of-class lives, first-generation students were less likely than traditional students to have positive experiences. In addition to working more hours off-campus, they were less likely to perceive faculty members as concerned with student development and teaching, to receive encouragement from friends to continue their enrollment, to attend a racial/cultural awareness workshop, and to have the experiences associated with living in a residence hall.

The two groups also differed in their perceptions of the climate of the institutions they attended. While first-generation students are less likely to feel physically threatened or like an outsider at their college, and more likely to view campus administrators as being flexible and concerned about students, they are also less likely to report that their institutions have an environment that encourages being critical, evaluative, and analytical and more likely to report experiencing racial/ethnic or gender discrimination in the classroom.

Thus, first-generation students differ from their traditional peers in both the personal and educational characteristics they bring with them to college and in the nature of the experiences they have during their first year there. With few exceptions, first-generation students are at a disadvantage in those comparisons. Overall, the picture suggests these students come less well-prepared and with more non-academic demands on them, and they

enter a world where they are less likely to experience many of the conditions that promote persistence, performance, and learning.

This study also sought to examine the extent to which differences in the two groups' college experiences might be related to first-year cognitive development. The evidence indicates that despite the fact that first-generation students (compared to traditional students) entered college with lower reading, math, and critical thinking skills, the two groups gained in their math and critical thinking abilities by about the same degree during the first year of college. Traditional students, however, showed greater gains in reading comprehension, even after initial reading skill differences were controlled. The findings across all three outcomes suggest that the group differences in college experiences have a small, but statistically significant differential effect on learning gains. The analyses done to investigate the nature of those differential effects, however, shed disappointingly little light on the nature or dynamics of those effects.

With respect to reading skills, taking social science courses is more important for improvement among first-generation students than for their traditional peers. It is worth noting that first-generation students, as a group, are less likely than traditional students to take social science courses during their first year. This finding implies a need to increase the number of such courses first-generation students take, perhaps reducing the number of pre-professional and technical courses, through academic advising and the design of social science courses that would have particular appeal for first-generation students.

Similarly, student perceptions that faculty members are concerned about student development and teaching are associated with reading skill gains for both groups, but the effect is particularly strong on traditional students. This finding is consistent with other research indicating that faculty members' orientations to students and to the humanities were positively related to gains in critical thinking (Astin, 1993). The importance of first-generation students' perceptions of their importance in faculty members' eyes offers strong support for Rendon's (1992) call for institutions to provide more ways to "validate" first-generation students as competent learners who deserve a place in their college or university.

While none of the statistically significant terms associated with gains in students' math skills were interpretable, students' perceptions of their institution's environment as encouraging being critical, evaluative, and analytical are associated with gains in critical thinking abilities for both first-generation and traditional students. The benefits, however, are greater for first-generation students. It would appear, then, that colleges and universities might maximize the critical thinking skill gains of all their students -- but particularly those of first-generation students -- by finding ways to promote their campus environment as one that values critical thinking, evaluative, and analytical skills. Possibilities include orientation programs, particularly those for both first-generation students, that stress the academic and intellectual life of the institution and greater involvement and contact with faculty members and upper division students. Orientation programs for first-generation students' parents or spouses could acquaint them with the academic demands that will be expected of their child or spouse and suggest ways in which they can be supportive. "Critical-thinking-across-the-

curriculum," or other courses that systematically try to enhance critical thinking are also likely to help, although the evidence to support this belief is still wanting. Campus and residence hall speaker and symposia programs offer other opportunities. Piecemeal or discrete programs or interventions, however, are less likely to have an effect on critical thinking skills -- and other learning skills -- than are a series of inter-related experiences that cut-across students' academic and non-academic lives, all mutually supportive and reinforcing (Pascarella & Terenzini, 1991).

The evidence from this study of first-generation students paints a portrait of a group of students entering America's colleges and universities in increasing numbers, a group that is likely to continue to grow over the next decade both in numbers and as a proportion of the total undergraduate student population. It is a group of traditionally-disadvantaged individuals who have not lost their faith in the ability of a college education to improve their intellectual, social, and economic lives. It is also a population that comes to college differing in many important ways from the students colleges and universities have traditionally served. Because of those differences, it is a population at-risk. We hope this study has contributed to our knowledge and understanding of first-generation students, the kinds of experiences they have in our institutions, and how we might enhance their opportunities to learn.

REFERENCES

- American College Testing Program. (1989). Report on the technical characteristics of CAAP: Pilot year 1, 1988-89. Iowa City, IA: Author.
- Astin, A. W. (1984). Student involvement: A developmental theory for higher education. Journal of College Student Personnel, 25, 297-308.
- Astin, A. W. (1993). What matters in college? Four Critical Year revisited. San Francisco: Jossey-Bass.
- Attinasi, Jr., L. C. (1989). Mexican American's perceptions of university attendance and the implications for freshman year persistence. Journal of Higher Education, 60, 247-277.
- Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. Review of Educational Research, 55, 485-540.
- Billson, J. M., & Terry, B. T. (1982). In search of the silken purse: Factors in attrition among first-generation students. College and University, 58, 57-75.
- Bowles, S., & Gintis, H. (1976). Schooling in capitalist America. New York: Basic Books.

- Chickering, A. W. (1974). Commuting versus resident students: Overcoming educational inequities of living off campus. San Francisco: Jossey-Bass.
- Cross, K. P. (1981). Adults as learners: Increasing participation and facilitating learning. San Francisco: Jossey-Bass.
- Jencks, C., & Riesman, D. (1968). The academic revolution. New York: Doubleday.
- Conklin, M. E., & Dailey, A. R. (1981). Does consistency of parental encouragement matter for secondary students? Sociology of Education, 54, 254-262.
- Hodgkinson, H. L. (1985). All one system: Demographics of education, kindergarten through graduate school. Washington, DC: Institute for Educational Leadership.
- Lara, J. (1992). Reflections: Bridging cultures. In L. S. Zwerling & H. B. London (Eds.), First-generation students: Confronting the cultural issues (pp. 65-70). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.
- Levine, A., and Associates. (1989). Shaping higher education's future: Demographic realities and opportunities, 1990-2000. San Francisco: Jossey-Bass.
- London, H. B. (1989). Breaking away: A study of first-generation college students and their families. American Journal of Education, 97, 144-170.
- Mow, S. L., & Nettles, M. T. (1990). Minority student access to, and persistence and performance in, college: A review of the trends and research literature. In J. S. Smart (Ed.), Higher education: Handbook of theory and research: Vol. VI (pp. 35-105). New York: Agathon.
- Murphy, P. E. (1981). Consumer buying roles on college choice: Parents' and students' perceptions. College and University, 56, 140-150.
- Pace, C. R. (1984). Measuring the quality of college student experiences. Los Angeles: University of California, Higher Education Research Institute.
- Pantages, T. J., & Creedon, C. F. (1978). Studies of college attrition: 1950-1975. Review of Educational Research, 48, 49-101.
- Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), Higher education: Handbook of theory and research (Vol. 1). New York: Agathon.
- Pascarella, E. T., & Terenzini, P. T. (1991). How college affects students: Findings and insights from twenty years of research. San Francisco: Jossey-Bass.

- Pratt, P. A., & Skaggs, C. T. (1989). First-generation college students: Are they at greater risk for attrition than their peers? Research in Rural Education, 6, 31-34.
- Rendon, L. I. (1992). From the barrio to the academy: Revelations of a Mexican American "scholarship girl." In L. S. Zwerling & H. B. London (Eds.), First-generation students: Confronting the cultural issues (pp. 55-64). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.
- Richardson, R. C., Jr., & Skinner, E. F. (1992). Helping first-generation minority students achieve degrees. In L. S. Zwerling & H. B. London (Eds.), First-generation students: Confronting the cultural issues (pp. 29-43). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.
- Rodriguez, R. (1975). Going home again: The new American scholarship boy. American Scholar, 44, 15-28.
- Rodriguez, R. (1982). Hunger of memory: The education of Richard Rodriguez -- An autobiography. Boston, MA: Godine.
- Skinner, E. F., & Richardson, R. C., Jr. (1988, May/June). Making it in a majority university: The minority graduate's perspective. Change, 34-42.
- Solomon, L. C., & Gordon, J. J. (1981). The characteristics and needs of adults in postsecondary education. Lexington, MA: Heath.
- Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. Interchange, 1, 64-85.
- Stage, F. K., & Hossler, D. (1989). Differences in family influences on college attendance plans for male and female ninth graders. Research in Higher Education, 30, 301-315.
- Terenzini, P. T., Rendon, L. I., Upcraft, M. L., Millar, S. B., Allison, K. A., Gregg, P. L., & Jalomo, R. (1994). The transition to college: Diverse students, diverse stories. Research in Higher Education, 35, 57-73.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 89-125.
- Tinto, V. (1987). Leaving College: Rethinking the causes and cures of student attrition. Chicago: University of Chicago Press.
- Upcraft, M. L. (in press). Teaching and today's college student. In R. Menges and M. Weimer (Eds.), Better teaching and learning in college: Using scholarship to improve practice. San Francisco: Jossey-Bass.

- Watson, G., & Glaser, E. (1980). Watson-Glaser Critical Thinking Appraisal. San Antonio, TX: Psychological Corporation.
- Weidman, J. (1989). Undergraduate socialization: A conceptual approach. In J. Smart (Ed.), Higher education: Handbook of theory and research (Vol. 5). New York: Agathon.
- Weis, L. (1985). Two worlds: Black students in an urban community college. Boston: Routledge and Keegan Paul.
- Weis, L. (1992). Discordant voices in the urban community college. In L. S. Zwerling & H. B. London (Eds.), First-generation students: Confronting the cultural issues (pp. 13-27). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.
- Winter, D. (1979). Defining and measuring the competencies of a liberal arts education. In Current Issues in Higher Education (Vol. 5). Washington, DC: American Association for Higher Education.
- Winter, D., McClelland, D., & Stewart, A. (1981). A new case for the liberal arts: Assessing institutional goals and student development. San Francisco: Jossey-Bass.
- York-Anderson, D. C., & Bowman, S. L. (1991). Assessing the college knowledge of first-generation and second-generation college students. Journal of College Student Development, 32, 116-122.

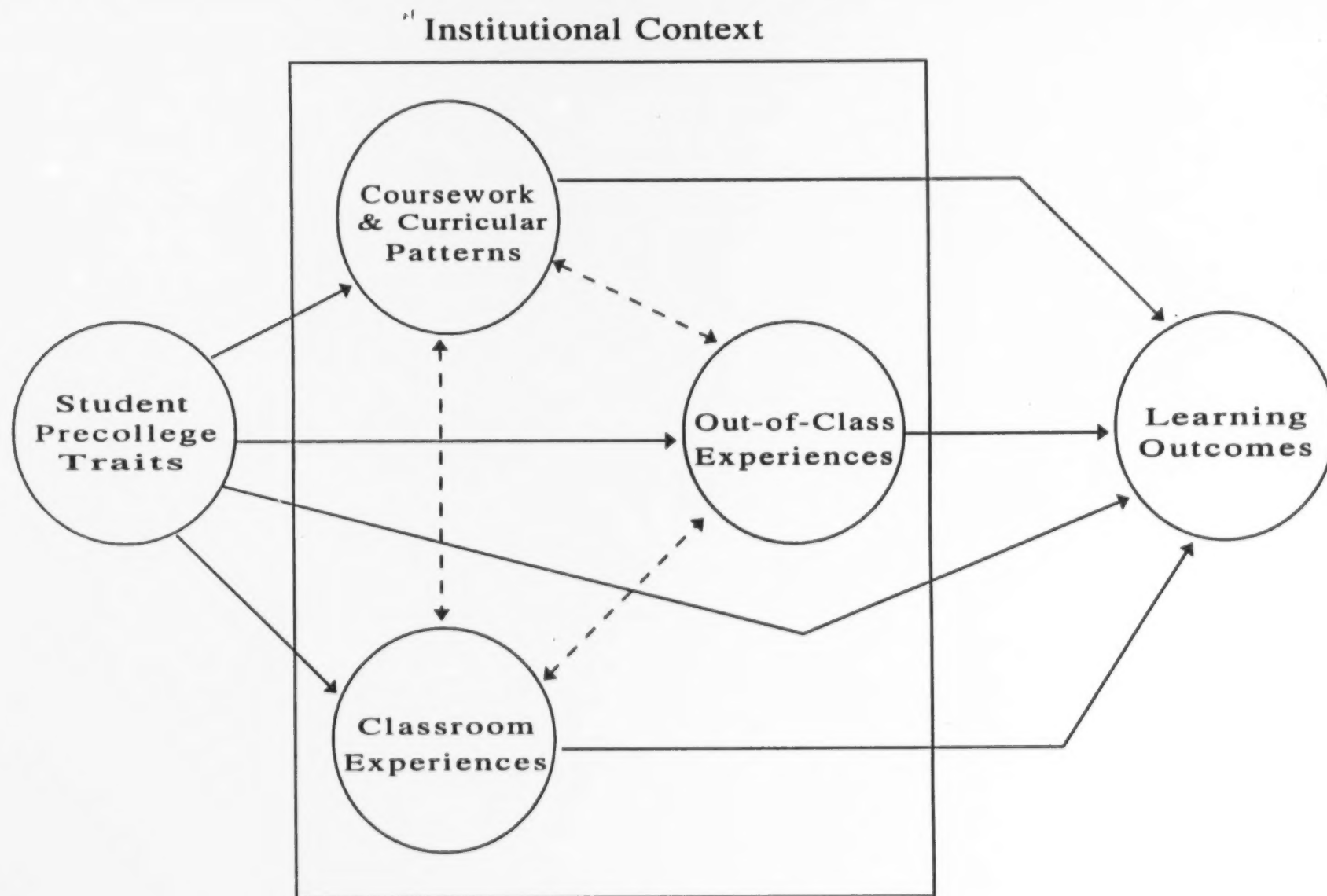


Figure 1

----- Reciprocal Causation

Table 1

Pre-College Characteristics on Which First-Generation and Traditional Students Differ

Step	Background Characteristics	Mean		SD		Beta Weight
		FG	Trad	FG	Trad	
1	Family Income (14 intervals, 1 = < \$6,000 to 14 = \$150,000 or more)	5.57	8.46	3.17	3.30	-.23
2	Hispanic (1=yes, 0=no)	0.36	0.13	0.48	0.33	.14
3	No. of dependent children (1=none to 5=three or more)	1.30	1.07	0.77	0.37	.07
4	CAAP Critical Thinking Score (Precollege measure)	59.65	62.72	5.42	5.52	-.07
5	Highest degree sought in lifetime anywhere (1=none to 5=doctorate)	3.95	4.25	0.87	0.73	-.06
6	Encouragement and support to attend college from family (1=no support to 4=extremely supportive)	3.52	3.77	0.77	0.62	.11
7	Encouragement and support from teachers (1=no support to 4=extremely supportive)	3.27	3.23*	0.88	0.94	-.08
8	Time spent socializing in high school (1=never to 4=very often)	3.27	3.45	0.76	0.68	-.06
9	Highest degree sought at this institution (1=none to 5=doctorate)	2.79	3.15	0.95	0.95	-.06
10	Will need extra time to complete degree (1=no chance to 4=very good chance)	2.81	2.55	0.84	0.85	.05
11	Time spent talking with teachers outside class in high school (1=never to 4=very often)	2.46	2.59	0.88	0.81	-.06
12	Gender (0=female, 1=male)	0.39	0.47	0.49	0.50	-.04*

Table 1 (Continued)

Step	Variable	Mean		SD		Beta Weight
		FG	Trad	FG	Trad	
13	Certainty about choice of major (1=not certain to 4=very certain)	2.90	2.74	0.99	1.04	.04*
14	Time spent working for pay in high school (1=never to 4=very often)	2.62	2.64	1.12	1.12	.04

^aTwo-tailed t-test indicates these means are not significantly different from one another ($p < .05$).

* $p < .05$; all other beta weights significant at $p < .01$ or beyond.

Background Variables Not Entering Analysis:

Importance of completing a degree at this institution; importance of completing a degree at any institution; year graduated from high school; encouragement and support to continue enrollment from friends; time spent studying in high school; time spent on volunteer work in high school; time spent exercising/sports in high school; time spent studying in the library in high school; time spent studying with friends in high school; time spent in clubs and organizations in high school; likelihood of stopping out; likelihood of transferring to another institution; precollege CAAP reading score; precollege CAAP math score; certainty student made the right college choice; college attendance prior to fall 1992; racial composition of high school; racial composition of neighborhood; African-American; minority-not Black or Hispanic; citizenship; English as a first language.

Table 2

College Experience on Which First-Generation and Traditional Students Differ

College Experience Variables	Mean		SD		Beta Weight ^a
	FG	Trad	FG	Trad	
Curricular Experiences					
No. of humanities and fine arts courses	1.93	2.68	2.07	2.34	-.06*
Total hours completed this academic year (1=six or fewer to 6=more than 24)	4.34	4.89	1.73	1.43	-.04
No. of technical and pre-professional courses	1.18	0.98	1.69	1.68	.04
Hours enrolled in Fall, 1992	2.56	2.78	0.74	0.55	-.04
Number of social sciences courses	2.06	2.48	1.84	1.99	-.03
Academic Experiences					
Participation in an honors program (1=yes, 2=no)	1.94	1.86	0.24	0.36	-.05
Hours per week spent studying (1=none to 6=more than 20 hours)	3.25	3.56	1.29	1.36	-.04
CSEQ Library Experiences Scale	2.00	2.00 ^b	0.59	0.57	.04

*All beta weights significant at $p < .05$ or beyond.

Table 2 (Continued)

College Experience Variables	Mean		SD		Beta Weight ^a
	FG	Trad	FG	Trad	
Out-of-Class Experiences					
Perceived faculty concern for student development and teaching (5-item scale with items such as "The faculty I have had contact with are generally interested in students"; 1=strongly disagree to 5=strongly agree)	3.30	3.51	0.61	0.65	-.09
Hours per week employed off-campus (1=none to 9=more than 35)	3.86	3.05	2.97	2.67	.07
Participated in a racial/cultural workshop (1=yes, 0=no)	0.13	0.24	0.34	0.43	-.04
Encouragement from friends to continue enrollment (1=strongly disagree to 5=strongly agree)	4.14	4.29	0.87	0.78	-.04
CSEQ Campus Residence Scale	1.49	1.88	0.77	0.88	-.04
Attended an orientation program (1=yes, 0=no)	0.81	0.85	0.40	0.36	.04
Relationship with student peers (7-item scale with items such as "Since coming to this institution I have developed close personal relationships with other students"; 1=strongly disagree to 5=strongly agree)	3.62	3.73	0.68	0.73	.06

Table 2 (Continued)

College Experience Variables	Mean		SD		Beta Weight ^a
	FG	Trad	FG	Trad	
Institutional Characteristics					
Relationships with administrative personnel and offices (1=impersonal, rigid, and bound by regulations to 7=helpful, considerate, and flexible)	4.49	4.22	1.61	1.52	.04
Environment emphasizes being critical, evaluative, and analytical (1=weak emphasis, to 7=strong emphasis)	4.99	5.14	1.20	1.16	-.04
Personally experienced discrimination based on race or gender (a 2-item scale where 1=strongly agree to 5=strongly disagree)	3.99	3.90	0.96	1.01	.04
Had discomfoting experiences (a 4-item scale including items about concerns for safety, people feeling uncomfortable around me, and others where 0=never happened and 5=at least once a day)	1.35	1.70	1.02	1.06	-.04
Environment has academic/scholarly emphasis (1=weak emphasis and 7=strong emphasis)	5.15	5.28	1.26	1.20	.05
Environment has emphasis on development of vocational and occupational competence (1=weak emphasis and 7=strong emphasis)	4.90	4.86	1.33	1.32	-.04

^aControlling for 13 precollege characteristics (precollege CAAP scores excluded) and only those other variables in the same college experience variable set.

^bTwo-tailed t-test indicates these means are not significantly different.

*All beta weights significant at $p < .05$ or beyond.

Table 2 (Continued)

Other College Variables Not Entering Analyses:

Curricular Variables

Number of minority/womens' studies courses
Number of mathematics courses
Number of natural science and engineering courses

Academic Experiences

Perception that courses emphasize personal relevance and practicality
Perceived Effectiveness of Instruction Scale
Hours/week spent studying with classmates
CSEQ Writing Experiences Scale
Instructor Feedback Scale
Number of advanced placement courses
Assignments promote systematic thinking scale
CSEQ Experiences with Faculty Scale
CSEQ Course Learning Scale

Out-of-Class Experiences

Joined a fraternity/sorority
Played intercollegiate sports
CSEQ Art, Music, and Theater Scale
Perception student had made the right college choice
Faculty Relations Scale
Encouragement of family to continue enrollment
CSEQ Clubs and Organizations Scale
Hours/week worked on-campus

Institutional Characteristics

Discrimination in Courses Scale
Discriminatory Environment Scale
Administrative Openness Scale
Discriminatory Words Scale
Environment emphasizes esthetic, expression and creativity
Experienced overt discrimination.

Table 3

Summary of Nature and Degree of Statistically Significant Interaction Effects

Interaction Term: Group ^a x . . .	Reading	Math	Critical Thinking
Perception environment emphasizes being critical, evaluative and analytical			++/+ ^b
Friends encourage continued enrollment	-/+ ^b		
Number of social sciences courses taken	+/0	+/-	
Number of hours worked off-campus	+/-		
Perceptions of faculty concern for student development and teaching	+/>++		
Perceptions of administrative openness to and consideration of students		+/-	

^a Coded 1=First-Generation, 0=Traditional^b First-Generation/Traditional

+ = positive effect

++ = strong positive effect

0 = no effect

- = negative effect

-- = strong negative effect